国際シンポジウム第１日目　講演1

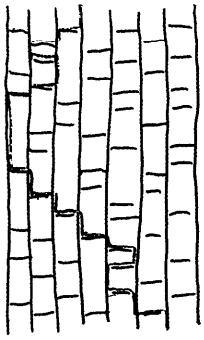
A Strategy for Human Survival

Minoru Oda*

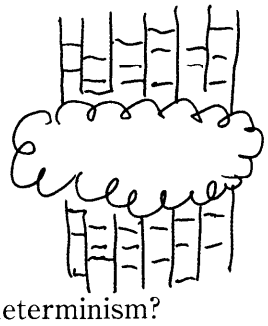
My talk as the introduction to this international seminar consists of 3 parts. The 1st part is about the history of science or the history of physics. And as the 2nd part, I'd like to introduce you to what this Tokyo University of Information Sciences is. And as the 3rd, I'd like to propose to found an Asian center for the study of the world, or the globe. And for that, I invited our colleagues from various disciplines and various places to discuss in details.

Now, the 1st part, the history of science and of physics, as perhaps I have already distributed to you, there are a few sheets of paper which title "how we human beings have evolved to such complexity from nothing", and it consists of a few cartoons -some joking cartoons -which, I hope, interest you. And I repeat to show this cartoon first. Let me start from talking about the history of science. Of course, we start from determinism in 18th and 19th century.

There is a demon of Laplace, which had a little book in which everything for the future is written down. And the determinism we call it "Amida-kuji" in Japan. If you start from one point, the end point is determined without any question. So that is the determinism of 18th and 19th



18－19 C. Determinism



neo-determinism?

ラプラスの悪魔
Laplace's Demon

ハイゼンベルグ
Heisenberg's dice

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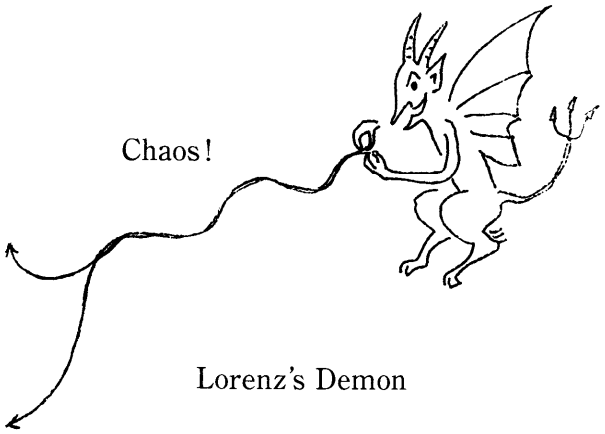
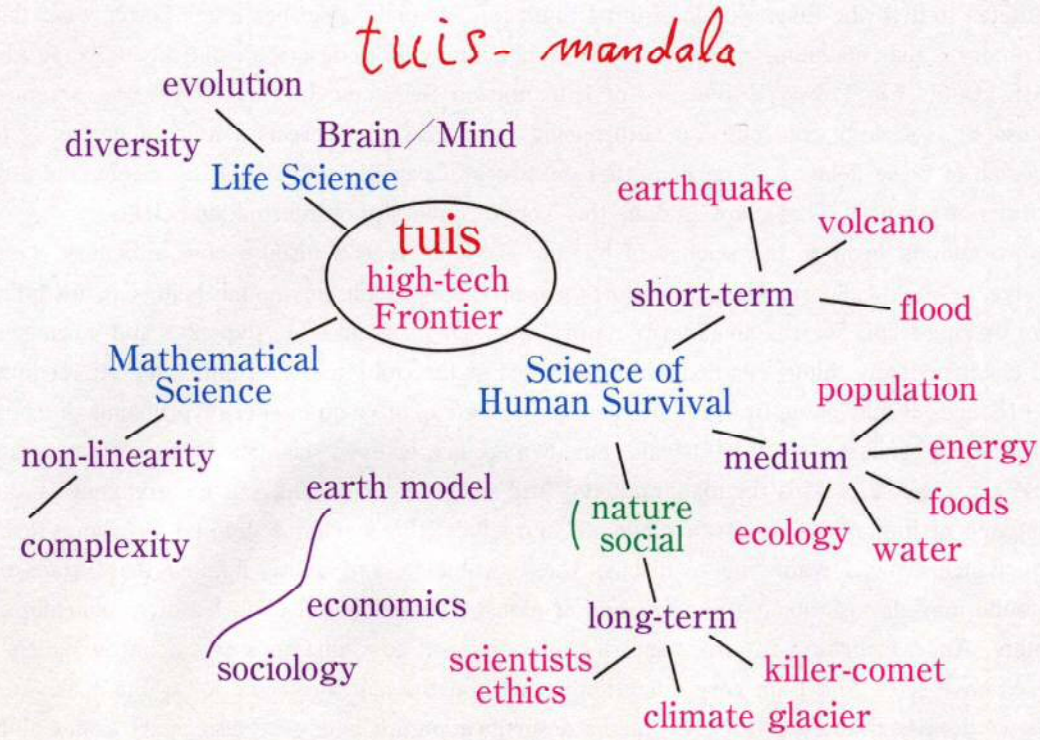
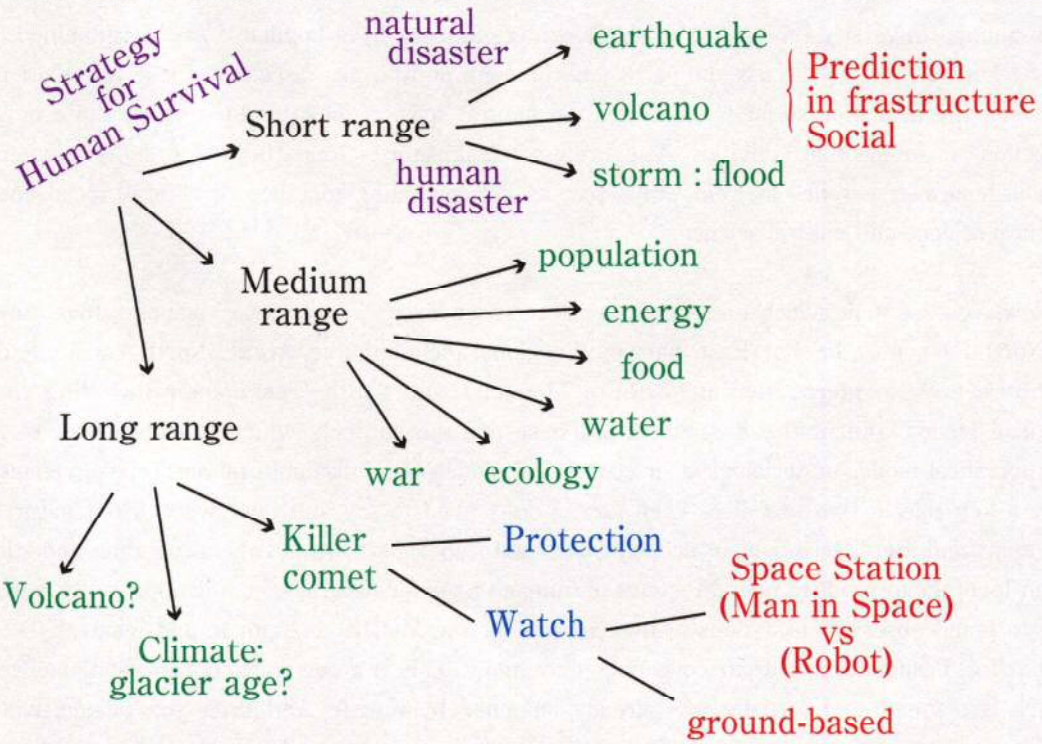


century. But in the 20th century, there was some cloud or mist on this deterministic diagram and you have to play dice to move from one place to another. Now this is still, unless you cheat, for the dice there is a new style of determinism. Now since these 50 years or so, E.N. Lorenz has produced a new idea of complexity: chaos, or fractals. What he claims is that even you start from a certain point, sometimes you may end up with a totally different conclusion. That is Lorenz's complexity, Lorenz's chaos, fractals. Now, it is since these 30 years, we have the complexity and chaos and fractals. In other words, this is "deterministic disorder," which I wrote down in my prints -so you could find a little more detail about that. Now then, the extreme of these fractals or complexities, I can name two. One is the earth environment, the other is ourselves, human beings, particularly the brain and mind of human beings. So I claim that the two extremes of this chaos or chaotic principles are earth environment, and brain and mind. These are what we are going to discuss today.

Let me show you another cartoon. Professor Masao Ito now claims that the human mind has its base in the brain, and of course, some of the neuro-scientists claim in a different way, but he claims that the mind has its base in the brain. I'm going to discuss about that a little later.

Now in the 2nd part of my talk, I'd like to discuss, or describe what really Tokyo University of Information Sciences is. This university -Tokyo University of Information Sciences- is a small and young university: only 10 or a little more years old. But now it has several directions of researches. One may be life science. Another may be mathematical science. And the other one, which is related to today's topic closely, is the science of human survival. So let's skip the first two branches, and let me come into a little more detail of the science of human survivals; or before that, I'll describe or understand what this small university, the Tokyo University of Information Sciences can do, can be described by the so-called "Mandala". Perhaps you may understand what Mandala is. It's a kind of overall collection of Buddhas. I don't have time, and also I don't want to come into


tuis- mandala
evolution
diversity
Brain／Mind
Life Science
tuis
high-tech
Frontier
earthquake
volcano
short-term
flood
Mathematical
Science
Science of
Human Survival
population
non-linearity
medium
energy
earth model
nature
social
foods
ecology
water
complexity
economics
long-term
sociology
scientists
ethics
killer-comet
climate glacier


Strategy
for
Human Survival
natural
disaster
earthquake
Prediction
in frastructure
Social
Short range
volcano
human
disaster
storm : flood
Medium
range
population
energy
food
water
Long range
war
ecology
Killer
comet
Protection
Volcano?
Space Station
(Man in Space)
vs
(Robot)
Watch
Climate:
glacier age?
ground-based

the detail to describe these Buddhas, but I think this Mandala describes much better what this university is than spending many words. So Mandala may be to describe what this university is. TUIS stands for Tokyo University of Information Sciences. In this university, science, philosophy, sociology, and cultural anthropology are mixed. There is a kind of networks to cover all of these fields. And perhaps these networks describe: network is the media, and also information sciences. That's how I define this Tokyo University of Information Sciences.

Now, coming back to the science of human survival, we can discuss how humanity could survive, or could collapse. There are short-term problems to kill our human beings, or medium-term or long-term. For the short-term, natural phenomena such as earthquakes and volcanoes, and floods or many things can disturb the survival or the continuation of humanity. As medium disturbances, it may come from the problem of population, problem of energy, problems of foods, water, ecology. Nature could kill us, also our own society, or even scientists, society of scientists could kill ourselves: this is the medium point. And as a long-term thing, our environment, or the existence of human beings itself could kill ourselves: that's what I defined as a long-term disturbance. Now, I want you to discuss these problems, and today, I know that Professor Matsuno may discuss about the prediction of global changes, based upon his own modeling of climate. And Professor Saburo Tamura's mission went to China to study a battle which I myself have seen. And I am very much impressed that the plateaux could kill China itself. And also, we discussed how we can prevent the desertification in China. And also, apart from China, how we could preserve the tropical jungle in Papua New Guinea, —Professor Matsuno may also talk about this thing.

In Sophia University Professor Morishima, who came back from London University, founded a new institute there to discuss the earth environment, and he has discussed about the relation between the literal, or social science, and the natural science. This might produce quite new directions of intellectual activities. Also Professor Yakushiji of Keio University, he is keen to establish new researches in Keio University, as for combining together the literal, social and cultural science and natural science.

Now, as a 3rd topic which I am going to ask for your discussion is -we are planning the study of North-East, may be Far East, part of the globe, including the Arctic, North Pacific, and Okhotsk, and Northern Siberia, Northern Mongolia, and South West Pacific including the tropical woods, and in the East deserts. These are the subjects which are discussed as a mathematical model, or sociological, or economical models. And also cultural anthropology could play a key role in these studies. Then now, I don't need to say, but here we can put natural scientists and literal scientists, or economists, or anthropologists: we put them together, and stir them together to produce new directions of humanity. As for natural scientific approaches, we'd like to found observation stations in this campus for the MODIS. I've got to add what MODIS stands for. Perhaps some of our colleagues may know. This is a new earth-observation satellite which is planned, and actually was already launched by NASA. And Professor Takagi, who appears tomorrow, is an expert on the earth observations, and he will come and discuss about

this matter. I hope that this tiny, little university here, Tokyo University of Information Sciences, could play some roles in combining all of these subjects together, and that is the purpose of this seminar -as far as I am concerned. And I hope you people from various parts of the world and from various disciplines could give us some hands and some brains to discuss the future of this planet. Thank you very much.

Q: Why don't you explain the "Mandala"?

A: Well, as I described, this university -Tokyo University of Information Sciences- have professors of physics, medical science, engineering, and economics and many fields -literatures, anthropology; and we do not, we are not willing to establish a department of physics, or a department of chemistry, or a department of mathematics, because these disciplines -natural science and cultural science and anthropology- these segmentation, to my mind, is too old-fashioned. And I think that if we could put them together, we could produce something new; and that's why mathematical science and the science of human survival are not necessarily different disciplines: they could be put together. As for the life science, perhaps today and tomorrow we don't have it, we haven't prepared any talks or any discussions; but as for the brain-and-mind science towards the end of this month, we are going to prepare another seminar in Riken Institute. So, by putting these quite diverse, diversified disciplines, we could join each other, and produce something new. That's what I define as the "Mandala". If I go in to talk about Mandala, on Buddhism, it may go on hours and hours. So perhaps you could understand what Mandala is. Buddhism is not a polytheism, yet Buddhism has so many kinds of Buddhas -the so-called "Bosatsu". But these Bosatsu join their idea or brain into one. That's a Mandala. Well, though a little over-simplified description, that's Mandala. And I hope that our university could play a role of the central Buddha for the many, many Bosatsus. And what combines and joins the many, many Bosatsu will be media, or information, or network. That's how a university does not have a department of science, a department of mathematics, a department of physics, yet it has the role to combine them in one thing. So, I know that, sometimes, cartoons may be misleading -cartoon makes a mistake, cartoon gives a wrong idea to people-, but still I feel that this cartoon gives you some idea of the role of a little university like this could play.

Q: I like the idea of the Bodhisattva as intended as a "Buddha-to-be", so perhaps you are suggesting that these interactions may be tentative, but, hopefully, they can be Bodhisattvas, so hopefully they proceed up to the dignity of Buddha. Is that correct?

Yes. That's exactly what I have in mind, or how I look at this particular university. I don't know what professor of ... There are professors from this university here in this room. I don't know what they are willing to say. For example, Professor Katsura, do you have anything to say?

Well, I know that what I said was very childish; and physicists are usually very childish, and perhaps you, too. And physicists, when we were students, we were taught, we were trained in a way "the simpler the better". But now, I feel that things are changing from what I learned; <simple is beautiful> was the philosophy with which we were trained until the mid-twentieth

century; but now things are changing, thanks to the appearance of complexity, fractals, and chaos, and so on. So I must say what I said was too much of over-simplification, but I think we can do something: we can move along towards some different directions. Sugimoto Sensei, do you have anything to say?

Prof. SUGIMOTO: I want to give one comment, and would like to ask one question. The comment first. The complexity problem. In the 20th century, the physics established a very beautiful system of theories which reflected Descartes' scheme that things are to be simplified and we have to study the simple things; and in order to understand the real world, it has to be constructed to the real world. But recently, the non-linear complex system becomes very important; actually, many systems in the world, in nature are very far away from the simple thermo-dynamic equilibrium state, and the situation is very far from the equilibrium state.

And yet, they are standing, I mean, not necessarily be changing, but the state is continuing. So, in order to understand such things, because the system is very non-linear, the relation between the cause and the results is not that simple as in the case of Descartes' science. So the cause changes the result, the result changes the cause, so the distinction between the cause and the result is very complex. So we have to understand such a situation totally, in a sense, but this is the problem which was left in the 20th century, and in the 21st century, we have to study such things much more. But many physicists dislike such situation because such situation can't be very beautifully formalized by mathematics.

You mean, "linear" thing?

Prof. SUGIMOTO: Yes, in the case of linear system, mathematics is very complete, and the theory becomes very clear and understandable and beautiful; but we have to go into some "dirty" problems. And in order to do such things, we have to use numerical techniques, and it may be related with the computer simulation and so on. So I think we have to change some...., think more about the beautifulness and the real world, and so on -that's one point.

Another point is, even if we understand such systems in natural science, the practice in the society is a very different matter. For example, medical science is very much different: medical practice in the society is very much different from medical science itself. So in that sense, the combination between literal, social science and natural science will be very, very important in the coming century. So in that relation, you talked about "Morishima Institute" of Sophia University, and my question is what efforts are being done in that institute?

Actually, we invited Professor Currie, who is the president of Sophia University, but unfortunately, he could not come. But I thought Doctor Currie urged Professor Morishima to come here, but he hasn't appeared, so I don't know. But his institute at Sophia University is one of the key institutions in this country to discuss about this complex system of the society: because it is complex, it becomes simple. That's a rather ironical statement. And so, if he could not come, I'd like to ask his paper attendance in this important... Yes, he has come back from London University after his long years of stay there, now he established, as you say, a new institution in Sophia University, and this is very important, but I must say I haven't seen him

since these few years -several years already- so I don't know.

――ありがとうございます。小田学長のお話で私は初めてこの大学にお邪魔しました。物理的には非常にささやかな施設に見えましたけれども知的には非常に壮大なことを考えておられるとまずは感銘を受けました。先程の曼陀羅（まんだら）の話は私もとりわけ面白いと思っていまして、それに関連して二つほど伺いたいのです。

一つはまさに曼陀羅の世界で、仏教ですと先程の菩薩が最終的に悟りを開いて仏陀になる。だから仏陀ツービーということで仏陀の悟りというかたちで、ある種のインテグレーションやユニフィケーションというか、統合つまりシステムをまとめるユニフィケーションやインテグレーションの原理なり方法論というのは割合はっきりしているのです。

今のサイエンス、とりわけナチュラルサイエンスとソーシャルサイエンスとの難しい関係で、やはり一番難しいのはまさに方法論も含めて、方法論自体も非常に変わってきているということも先程先生のおっしゃった通りだと思うのですけれども、そういう流れの中で曼陀羅としてまとめていく、結び付けていくあるいは統合化していくものは何かという辺り、今の方法論的なものを含めて何かヒントをいただけると……。私も実はそんな話をさせていただこうかと思っていたのです。

第２点は仏教の教えの中で「修証一等」というのですか、悟りと修行とが一枚だ、不可分だという中で私は最近の環境問題だけではなく社会的な問題に科学的なアプローチ、これ自身がかなり難しいと思います。社会科学と自然科学の大きなギャップというのはまさに社会科学の場合には経済学でさえ方法論的な行き詰まりがあって普通の人間の常識を超えるところで……。

例えば経済学というのは多分ニュートン力学のモデルをずっと使ってきたのだと思うのです。最近はいろいろ不確定性、統計だとか確率論なども少しは入ってきておりますけれども基本的にはニュートン力学的なパラダイムでやってきています。

それの限界がはっきりしている中で、結局はハイゼンベルグの不確性原理ではないですけれども、場を乱すというか場にかかわることで初めて、まさに先程の原因と結果のコーザルリレーションもそうなのですが、いわゆる実践というのですかプラクティスと、プラクティスの中で初めて、つまり状況なり場が変わることを通じて不確実性なり不確定性の実態が明らかになってくるという意味で、知なり学なりと実践との関係あるいは普遍的な知識と実践との関係というのは仏教のアナログでいうとものすごく基本的な問題を含んでいるという感じがしております。まさにそういう普遍値と実践との関係、仏教の悟りと修行との一体性も含めてどう感じておられるかという２点、私の印象プラス、何かご示唆いただければという質問です。

As the first point, as you said, natural scientists and social scientists are rather separated, but I think it is wrong to say that social scientists became social scientists because they hated mathematics or mathematical thought, and natural scientists, when they were students, at least when I was a student, I didn't like history, and economics, and so forth, because these disciplines were said to be "to memorize things". So those students who were not skillful became natural scientists, but that's too much simple. So nowadays, I think social scientists need mathematics, and if social scientists hated natural science because of mathematics, then the teachers were wrong: teachers in university, teachers in high school were wrong. So I think that natural

science and social science has no reason to be separated, that's one thing which is the reaction to your first comment.

Now then, the "Satori", or enlightenment and "Shugyo". Well, I am ashamed to say that I used these words "Mandala" or the Buddhism without knowing or thinking these things so deeply, so I must confess that I cannot answer, I cannot react to your comment, and I'd rather like you to talk about this in your talk. Sorry, particularly for the second point, I cannot react -I am rather ashamed that I said something which I don't know.

――社会科学と自然科学はもちろん一緒の場で、例えば一つの言語である数学を介したコミュニケーションはできるのだと思います。先程の仏陀と菩薩の関係で言いますと、何かやはりある種の上下関係か前後関係が前提とされている中で共通のユニファイングセオリーとかインテグレーティッドメソッドなどがあり得るかどうか、そこはいかがでしょうか。
――私は今の前後関係というのはおっしゃる通りだと思うので、そういう関係が完全にあるのだとプレジュディスを持っておりますけれどもいかがでしょうか。

Do you have anything, Prof. Sugimoto?

Prof. SUGIMOTO: Concerning the question for the existence of a unified theory to treat everything -everything including social and natural sciences- that question will be of no use, at least at present. The theory is very much different from... it has a structure -the theory for everything cannot exist, I think. For instance, in the case of the real world, the theory for atomic sciences is the quantum theory, and also, for instance, when we study about very high-energy situation of the speed of light is very close to the motion of matter. we have to treat things by a relativistic theory. But some people of the history of sciences say that the quantum mechanics broke the Newtonian paradigm, and also the relativist theory broke the Newtonian paradigm of absolute time-space and time. At that time, I would like to ask such history-of-science people: "you came here by train, if we designed the train and manufactured the train by means of the relativistic theory, what would happen?" So, in that case, we have to need to make calculation of more than 20 digits -only the last part of the number changes. But in the case of Newtonian paradigm, the first 20 digits were already subtracted. So it implied that the theory can be useful -different theories can be useful in different paradigms of actual situation.

So I think it is not necessary to look for the unified theory, and we have to deal with different things at that level of methodological structure.

Well, but I am surprised: I thought you theorists were looking for the unified theory.

Prof. SUGIMOTO No, I am not.

Well, you may not, but your colleagues, theorists, are looking around for a unified theory. Uh, elementary part (?) of physicists? Yes? How about that?

――学問分野間の協力なり対話なりできると思うのですが、その場合はセオリーまでいかなくても何らかのハイポゼシスがあるのだと思います。特に社会科学と自然科学みたいな非常の溝の深い二つのカルチャーの間の統合というか協力ということになると先程の曼陀羅に戻ると、やはり釈迦の徳だとか悟りへの期待だとかという少なくてもインテグレーションのメソドロジーあるいはメソドロジーまではっきりしなくても何らかのアプローチがない限りばらばらの意見の開陳にとどまるのではないか。

あとでお話ししますけれども、戦後ずっとフレームワークの議論、つまりイデオロギーのあとに知的なフレームワークとは何かという議論のときに結局知的相対主義でそれぞれの立場でそれぞれが言ってることが正しいという議論以上のところになかなか行かないという問題になってしまうと思うのです。知的相対主義に陥らないで、かつ何か統合するための、つまり曼陀羅が曼陀羅になり得るための何か共通な知的基盤がベースがいるのではないかと思います。

Well, I totally agree with you, and that's I described to you in just one word "Mandala". And I believe in the existence of this unified theory or unified means, I think. Not necessarily the theory, but unification -I described it by the world of Mandala. I am surprised that Professor Sugimoto doesn't believe in the existence of an unified theory. Now, here some person came in with a philosopher in Japanese philosophy, and Chinese philosophy, and Indian philosophy-, you are. So perhaps we can discuss about that later, but he must know about the Mandala (laugh). Sorry.